APPLICATION FOR UNITED STATES LETTERS PATENT

METHOD AND PLANT FOR THE HOT ROLLING OF STRIP

HM-123

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a method and a plant for the hot rolling of strip, in which the rolling stock is rolled in at least one reversing roughing stand with a number of roughing passes into a broken-down strip, and the broken-down strip is transported over an intermediate roller table into at least one Steckel finishing stand and the strip is finish-rolled in the finishing stand with a number of passes into a finished strip having a predetermined thickness, and the strip is finally wound into a coil.

2. Description of the Related Art

In a method and a plant for carrying out the method in the prior art, it is conventional to select the length of the roller table between the roughing stand and the Steckel finishing stand in such a way that, after emerging from the roughing stand, the broken-down strip rests "freely" between the roughing stand and the cropping shears. Accordingly, the length of the roller table is essentially determined by the length of the broken-down strip.

This results in the disadvantage that either the length of the broken-down strip, and thus, the predetermined charge weight of the product are limited, or that the plant requires a relatively large space, wherein, in that case, there is the additional disadvantage that the broken-down strip enters the Steckel finishing stand with a low temperature because of the heat loss occurring on the relatively long transport path between roughing stand and Steckel finishing stand. The increased load in the finishing stand caused by the lower temperature of the strip has a disadvantageous effect on the finish-rolling process, wherein additionally smaller reductions are achieved in each pass.

SUMMARY OF THE INVENTION

Therefore, it is the primary object of the present invention to provide a method and a plant for the hot rolling of strip of the type described above in which the disadvantages discussed above are avoided and hot rolling can be carried out with the use of uncomplicated measures and means.

In accordance with the present invention, in the method of the type described above, the length of the intermediate roller table determined by the length of the broken-down strip is shortened and tandem rolling is carried out in the roughing stand and the finishing stand at least during the last breaking-down pass of the strip.

The possibility of shortening the roller table is advantageously provided in accordance with the present invention by dropping the requirement for a "free" runout of the broken-down strip following one of the last roughing passes or following the last roughing pass, and by instead carrying out tandem rolling by the roughing stand and the finishing stand, wherein the rolling speeds of the stands are synchronized.

In addition to shortening the roller table, and, thus, a corresponding linear shortening of the total length of the plant and decreased investment and operating costs, the present invention further provides the significant advantage that the broken-down strip has a higher temperature when it enters the Steckel finishing stand. This has a positive effect on finish-rolling and, for example, facilitates lower loads in the finishing stand and produces greater reductions.

The plant for the hot rolling of strip according to the present invention includes at least one reversing breaking-down stand for breaking down the strip and at least one Steckel finishing stand for reducing the broken-down strip to finished strip, wherein the roughing stand and the finishing stand are connected to each other through a roller table whose length is determined by the length of the broken-down strip. The plant is intended especially for carrying out the above-described method according to the present invention and is characterized in that the length of the roller table corresponds at most to the length of the broken-down strip prior to one of the last breaking-down passes.

The length of the roller table may approximately correspond to the distance between the roughing stand and the shears.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of the disclosure. For a better understanding of the invention, its operating advantages, specific objects attained by its use, reference should be had to the drawing and descriptive manner in which there are illustrated and described preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

Fig. 1 is a schematic illustration of a conventional plant for the hot rolling of strip; and

Fig. 2 is a schematic illustration of a plant for the hot rolling of strip according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 of the drawing shows a prior art embodiment of a plant for the hot-rolling of strip which includes at least one reversing roughing stand 1 for breaking-down rolling of a strip 10 and at least one Steckel finishing stand 3 for reducing the broken-down strip 10 into finished strip. Both plant components, i.e., roughing stand 1 and finishing stand 3, are connected to each other through an intermediate roller table 2.

As shown in Fig. 1, in the conventional plant, the length of the intermediate table 2 is selected in such a way that, after emerging from the roughing stand 1 which may be the last roughing stand of a sequence of roughing stands, the broken-down strip 10 is placed freely between the roughing stand 1 and the cropping shears 4. This means that the length of the intermediate roller table 2 is determined essentially by the length of the broken-down strip.

Solutions with intermediate storage units or coil boxes, which are usually used in tandem rolling trains for hot strip and facilitate shortening of the distance between the roughing stand and the finishing train, have not become known in the past in Steckel rolling trains. As shown in Fig. 1, the broken-down strip has the length L_1 which corresponds to the distance between

roughing stand 1 and cropping shears 4 and which is substantially shorter than the distance A_1 between the roughing stand 1 and the finishing stand 3. As it is known in the art, the finishing stand 3 includes reeling furnaces 5 and 6.

An embodiment of the plant according to the present invention is shown in Fig. 2. In that embodiment, the length A_2 of the intermediate roller table 2 is at most equal to the length L_2 of the broken-down strip 10 prior to the roughing pass n-1, wherein n is the number of passes in the roughing stand.

In the following, the invention will be explained in more detail with the aid of an example.

Example:

The following parameters are given:

- Weight: 18kg/mm
- Thickness of broken-down strip: 25mm
- Length of broken-down strip: 94,74mm

In the conventional plant according to Fig. 1, the distance between the roughing stand 1 and the finishing stand 3 is

approximately 120m, wherein the number of passes in the roughing stand 1 is n. The broken-down strip 10 just rolls out freely onto the intermediate roller table 2 between the roughing stand 1 and the cropping shears 4.

In accordance with the present invention as illustrated in Fig. 2, when the roller table is shortened to a length A_2 in accordance with a broken-down strip length during pass n-2, tandem rolling in roughing stand 1 and finishing stand 3 takes place because the strip 10 having the length L_2 is longer than the distance A_2 between the roughing stand 1 and the finishing stand 3.

- Coil weight: 18kg/mm
- Thickness of broken-down strip (n-2): 25mm x 1/0.75 x 1/0.75 = 44.44mm (assuming a reduction of 25% each in the last two roughing passes)
- Length of broken-down strip (n-2): 53.29mm

Consequently, the required length of the intermediate roller table 2 can be reduced by 94.74m - 53.29m = 41.45m .

As explained above, in addition to shortening the length of the intermediate roller table, the present invention provides the

advantage of an increased temperature of the broken-down strip which has positive effects on finish-rolling.

In accordance with the method of the present invention, during tandem rolling, the rolling speeds of roughing stand 1 and finishing stand 3 are synchronized.

In addition, it is possible during tandem rolling to synchronize the transport speed and the transport direction of the intermediate roller table with the rolling speed and the rolling direction of the roughing stand 1 and the finishing stand 3.

While specific embodiments of the invention have been shown and described in detail to illustrate the inventive principles, it will be understood that the invention may be embodied otherwise without departing from such principles.